DOCUMENT RESUME

ED 202 597 PS 012 199

AUTHOR DeLoache, Judy S.; And Others
TITLE Self-Correction Strategies in Early Cognitive Development.
SPONS AGENCY Illinois Univ., Urbana.; National Inst. of Child Health and Human Development (NIH), Bethesda, Md.
PUB DATE Apr 81
GRANT NICHHD-HD-05951
NOTE 10p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Boston, MA, April 2-5, 1981).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Age Differences; *Behavior Patterns; Cognitive Development; *Concept Formation; Early Childhood Education; Error Patterns; *Object Manipulation; Pattern Recognition; *Serial Ordering; *Young Children
IDENTIFIERS Self Correction Strategies

ABSTRACT

A seriation task (assembling a set of nesting cups) was used in this study to examine developmental changes in young children's ability to restructure a situation. Forty young children, eight each at 18, 24, 30, 36, and 40 months of age, participated in the study. Each child was presented with five nesting cups and was told he or she could play with them. No specific instructions were given. If after 1 - 1 1/2 minutes of spontaneous manipulation of the cups, the child had not completely seriated them, the experimenter took the cups and showed the subject (without letting the child see the assembly process) that the cups all fit together. Then the separate cups were given back to the child for further manipulation. The trial ended when (a) the child completely seriated the cups, (b) the child refused to continue, or (c) two minutes had elapsed. All children's activities were videotaped, and all their moves (any combination of two or more cups) were scored as correct or incorrect. An error involved any instance in which two or more cups were combined in any way other than perfect seriation. Results indicated that while the subjects did not differ with age in the likelihood they would try to correct a set of nonseriated cups, they did differ in the kind of self correction strategies they employed. Correction strategies ranged from very simple procedures applied to single cups to more complex strategies involving the relationships among all the cups. (Author/MP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED202597

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SELF-CORRECTION STRATEGIES IN EARLY COGNITIVE DEVELOPMENT

Judy S. DeLoache
University of Illinois

Susan Sugarman
Princeton University

Ann L. Brown
University of Illinois

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Judy S. DeLoache

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PS012199

This paper was presented at the meeting of the Society for Research in Child Development, Boston, April, 1981.

This research was supported by Grant HD 05951 from the National Institute of Child Health and Human Development and by a grant from the Research Board of the University of Illinois.

To err is human... In fact, it is probably rare to solve problems through a series of perfect maneuvers. A crucial part of problem solving, of logical insight, of efficient thought in general, is the ability to overcome errors or obstacles. One has to be able to interrupt ongoing activity, back off, restructure the problem, and then go about doing the same thing but in a new way.

The focus of this paper is error correction, and particularly the early development of procedures or strategies for correcting errors. We are not so concerned with whether young children correct their errors, but rather in how they attempt to do so. We are looking for developmental changes in self-correction procedures, specifically changes that have to do with the child's ability or tendency to restructure a situation. This research focuses on children between 18 and 42 months of age, because we have evidence from other investigations that the ability to restructure a situation and to reorganize behavior accordingly emerges during this time.

A seriation task (assembling a set of nesting cups) was used in this study of cognitive self-correction. This is an excellent task for our purposes; because of the functional feedback provided by the cups, young children will spontaneously work at trying to get them nested together. Also, it is relatively obvious even to a young child when an error is made, at least when a larger cup is placed on top of a smaller one. Thus, this task enables us to look at what children do when they have placed nonfitting cups together; i.e., when they have made an error.

The subjects in this study were 40 young children, 8 each at 18, 24, 30, 36, and 42 months of age. Each child was presented with 5 nesting cups, scattered on the table. No specific instructions were given; the subject

was simply told she could play with the cups. If after 1-1/2 minutes of spontaneous manipulation of the cups, the child had not completely seriated them, the experimenter took the cups and showed the subject that they all fit together (without letting the child see the assembly process). Then the separate cups were given back to the child for further manipulation. The trial ended when (a) the child had completely seriated the cups (had all five nested together); (b) the child refused to continue; or (c) two minutes had elapsed.

Table 1 shows the number of subjects at each age who achieved complete seriation, i.e., all 5 cups fitted together in order. As one would expect, the number of successful seriators increased with age.

Our primary interest, however, was what children did when cups did not fit together, what strategies they used to correct their assembly errors. All the children's activity with the cups was videotaped. All moves (any combination of two or more cups) were scored as correct or incorrect. An error involved any instance where two or more cups were combined in any way other than perfect seriation. Thus, a subject could err either by putting a larger cup on top of a smaller one (putting cup 5 on cup 3), or by nesting one cup inside a cup that is more than one step larger than it (by putting 3 in 5).*

There was a slight increase with age in the total number of moves, but there were no age differences in the proportion of moves that were correct or incorrect. Nor were there any age differences in the proportion of errors that were followed by correction attempts. Thus, children did not really differ with age in <u>how likely</u> they were to try to correct a set of non-seriated cups.

---

*For simplicity of writing, we have used the singular "cup" to refer to either a single cup or a stack of two or more cups.

They did differ, however, in how they tried to make corrections. We found clear age differences in the kind of self-correction strategies young children used, with a progression from very simple procedures applied to single cups to more complex strategies directed toward the relationships among the whole set of cups. Because 30 months seemed to be a transition point in the emergence of correction strategies, the data for the 30-month olds were combined with the two older groups. All the analyses thus compared a younger group, which included the 18 and 24-month olds, and an older group, comprising the 30, 36, and 42-month old children.

The most primitive strategy, which was most frequently employed by the younger subjects, was to attempt to use force (Table 2). When a larger cup was put on top of a smaller one, the children would press down hard on the non-fitting cup, occasionally even twisting it or taking it off and pressing it back on again. For these young subjects, most of the pressing occurred when they had a large cup on top of a smaller one. They were especially likely to resort to pressing when cup 5 (the largest cup) happened to be on top. While this was a dominant strategy for the youngest group, it was also resorted to by the older children, but not so frequently and in different ways. The older subjects' presses generally occurred in two different situations. After an unsuccessful series of manuevers with a given cup or stack, they might try to press it onto some other cup. Thus, pressing was the first procedure applied by the younger children, but only seemed to serve as a last resort for the older ones--after some other maneuver had failed. The other main category of presses for the older subjects, in fact the majority, occurred when they tried to place a cup into a base cup in which it would normally fit, but that already had a smaller cup in it (e.g., the subject tried to put cup 4 in cup 5, which

already held 3). When the non-fitting cup is placed on top, it obscures the intervening cup, so it looks like the top cup ought to go in. At this point, the older child would try to force it in.

The next most frequent way the youngest children attempted to deal with errors was to "try an alternative". After placing one cup on another into which it did not fit perfectly, the subject removed the non-fitting cup and did one of two things: she either moved it to a new base cup or placed a new top cup on the first base. Thus, the subject either tried to find an alternative base for the non-fitting cup or tried an alternative top for the original base.

The important thing about these two strategies that were commonly used by the youngest subjects is that they involve minimal restructuring. In the press strategy, the child is focusing his reorganizational efforts on a single, non-fitting cup--the same cup he started with. Trying an alternative involves slightly greater flexibility (the child doesn't just do the same thing with more vigor, as in a press), and concerns the relation between two cups; but it is still restricted to the consideration of only two cups at a time, i.e., to the consideration of one relation. Furthermore, the focal cup remains the same. When trying to find an alternative base for a cup, the child's actions are focused on that one cup and relating it to another cup or to a series of other cups.

The other main thing the youngest subjects did was to disassemble a set of nonfitting cups. They took apart some or all of the cups and either just left them or tried to put part or all of them back together again. However, they rarely did so successfully and usually failed to improve at all upon the original construction. This unsuccessful strategy did not distinguish the younger from the older subjects; the older children also

often took apart sets of cups without improving the extent of seriation.

What did distinguish the two age groups was the increase, beginning at 30 months, in the use of more complex and generally more successful self-correction strategies (see Tables 3, 4, 5). What makes the strategies employed by the older children more complex or sophisticated is that they are directed toward more than two cups and involve the coordination of relations between cups.

One strategy that appeared much more often in the 36 and 42-month old groups was insertion (see Table 3). The subject took apart a stack of cups, and then either succeeded in rearranging the same cups into the correct order or added a new cup to the stack in its correctly seriated position. Executing this maneuver requires that the child pay attention to multiple relations, not just to a single relation between two cups at a time.

The other sophisticated strategy was reversal. After placing two nonfitting cups together, the child immediately reversed the relationship between them (e.g., subject placed cup 5 on top of cup 4, then immediately switched 5 to the bottom and 4 to the top). Although there are only two cups (or stacks) involved, the advance lies in the child's ability to reverse the relation that exists between cups. To do so, she has to recognize that a different relationship between those two cups is possible.

Before the reversal strategy appears, its absence can be quite striking. Several young children who never reversed cups managed to correctly seriate cups 1 through 4, but then seemed unable to get any further. One 24-month old had a long series of repeatedly putting cup 5 on top of 1 through 4, taking it off, putting it back on, pressing, twisting, back off, on again, etc. Finally, the child just gave up. Probably one reason that young children resort to pressing with cup 5 so often is that if the child does not

happen to start with 5 as a base, she may be unable to get it into its correct position.

In summary, the findings from this study show that development of self-correction in a seriation task consists not so much in children getting better at correcting their mistakes, but in changes in how they go about trying to remedy their errors. Initially, if one cup doesn't fit into another, all the child's efforts are focused on trying to get that one cup to fit where it is. This strategy is not only inflexible; it has no chance of succeeding. Second, if two cups don't fit together, the child is able to take one of those cups and recombine it with another. Here, the child is focusing on the relation between cups, but is attending to only one relation at a time. Third, at around 30 months, the children's procedures become increasingly complex and adaptive. They are able to coordinate relations among cups. They can take a stack of cups and change the relations among them, or they can bring in new cups to achieve an improved, i.e., a more seriated, product. Children also become capable of reversing the relationship between cups.

These charges in young children's self-correction strategies parallel other aspects of cognitive development in this period, including changes in procedures for putting seriated cups together and procedures for organizing objects into classes.

Table 1

Number of Ss who Seriated All Cups

Age	Spontaneous	Insert Trial
18 months	0	0
24 months	3*	0
30 months	4**	0
36 months	4	1
42 months	7*	3

* = Perfect seriation (i.e., no errors)

Table 2

Correction Strategies:
Number of Occurrences

Age	Press	Try Alternative	Disassemble	Insert	Reversal
18	17	13 (5)*	11	2 (2)	0 (0)
24	5	7 (3)	4	0 (0)	5 (1)
30	8	13 (4)	6	2 (1)	5 (3)
36	11	8 (3)	8	7 (5)	6 (3)
42	7	3 (2)	16	8 (6)	14 (6)

* Number in parentheses = number of subjects who use the strategy

Table 3*

Insertions

	Age	
	18, 24	30, 36, 42
-	13	9
+	2	12

* Total number of Ss = 36; 4 Ss had perfect seriation, and hence no self-corrections.
$\chi^2 = 5.343$, $p < .025$

Table 4

Reversals

	Age	
	18, 24	30, 36, 42
-	14	9
+	1	12

$\chi^2 = 7.599$, $p < .01$

Table 5

Best Strategy

	Age	
	18, 24	30, 36, 42
Simple	11	4
Complex	4	17

$\chi^2 = 8.493$, $p < .005$